

Remarks

Claims 22-28, 30, and 32-39 are now pending in this application. Applicants have amended claims 24, 25, 33, 34, 38, and 39 to clarify the present invention. Applicants respectfully request favorable reconsideration of this case.

The Examiner objected to the drawings under 37 C.F.R. § 1.84. Applicants submit herewith under separate cover a request to approve drawing corrections and one sheet of replacement drawings including Figs. 4a, 4b and 5. Applicants have labelled the two parts of Fig. 4 and Fig. 4a and Fig. 4b. Applicants have removed the numeral "9" from Fig. 4a. Applicants have added the reference character 9 to fig. 5 to identify the spring force recited in claims 26 and 37. Applicants have amended the specification to include reference character 9. Fig. 5 does not represent prior art since although Fig. 5 shows a delta robot, which was known, the delta robot includes the joints according to the present invention, which were not known prior to the present invention. Applicants have amended claims 24 and 33 to clarify the shape of the grooves. Applicants have amended claims 25 and 34 to clarify the location of the grooves on the bearing member. Fig. 4 illustrates the deformed bearing member. In view of the above, Applicants respectfully request approval of the corrected drawings and withdrawal of this objection to the drawings.

Applicants have amended claims 38 and 39 along the lines suggested by the Examiner. Accordingly, Applicants respectfully request withdrawal of the objection to claims 38 and 39.

Applicants have amended claims 38 and 39 to clarify the arrangement of the joint socket and joint housing. Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 112, first paragraph.

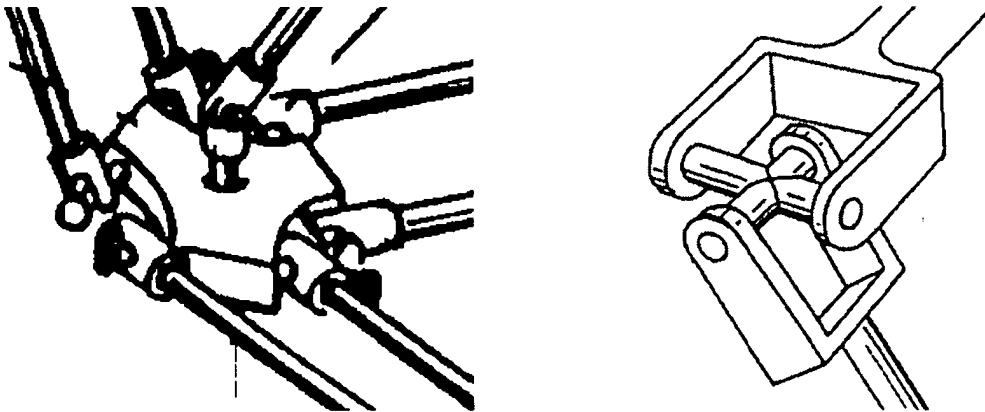
The Examiner rejected claims 23-28, 30, and 32-39 under 35 U.S.C. § 112, second paragraph. Applicants have amended claims 38 and 39 to clarify the invention. Significantly, the joint socket, joint housing and bearing surface do not extend about more than approximately one-half or less of the joint ball. The joint ball may move on the bearing surface such that the approximately one-half or less of the joint ball may be moved about the joint ball. However, the extent of the joint socket, joint housing and bearing surface about the joint ball is approximately one-half or less of the joint ball. Therefore, Applicants submit that claims 23-28, 30, and 32-39 comply with 35 U.S.C. § 112, second paragraph and respectfully request withdrawal of this rejection.

The Examiner rejects claims 23-28, 30 and 32-39 under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent 4,976,582 to Clavel in view of U.S. patent 2,733,085 to Latzen and U.S. patent 4,430,016 to Matsuoka.

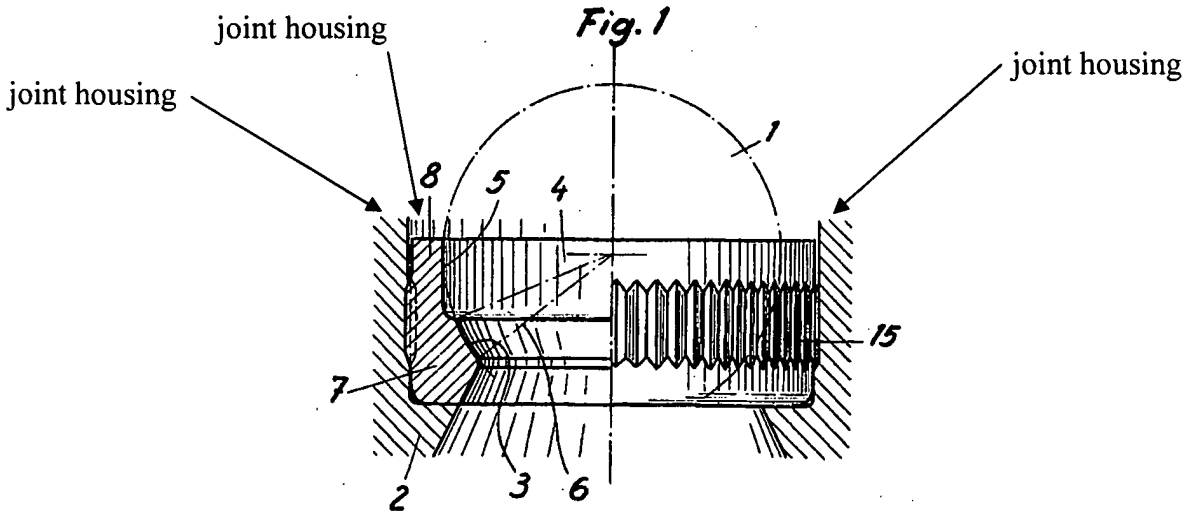
The combination of Clavel, Latzen and Matsuoka does not suggest the present invention as recited in claims 38 or 39, since, among other things, the combination does not suggest a joint socket enclosing a joint ball with a space approximately one-half the ball or less. The combination also does not suggest a ball and socket joint that includes a bearing member that engages only a distal half of each joint ball or only a portion of the distal half of each joint ball

and only a portion of a proximal half of each joint ball.

Clavel does not suggest the ball and socket joint according to the present invention. Below are reproduced the joints suggested by Clavel. As can be seen in both of these views, Clavel suggests cardan joints, which are multi-element linkages. Clavel describes these joints as col. 4, lines 13-17. Cardan joints are couplings using a double yoke and four-point center cross. Cardan joints are used as couplings in the driveshafts of rear-wheel drive cars, but can produce uneven shaft speeds when operated at joint angles of more than a few degrees. Cardan joints include many moving parts that result in inherent high friction and complexity in changing any parts. Such a joint does not suggest the ball and socket joint of the present invention.



Latzen suggests joints that virtually completely envelop the ball. One example of such a joint is shown in Fig. 1, which is reproduced below. It is important to recognize that Fig. 1 and the other figures illustrate cut-away views of the joints, as indicated in by the arrows in Fig. 1 as reproduced below, and that the joint housing 2 extends about the entire ball head. Fig. 2 illustrates a similar view and Figs. 3 and 4 illustrate a non-cut away views of the housing almost entirely surrounding the ball.



Such joint housing that surrounds more that approximately one-half of the joint ball is contrary to the present invention as recited in the claims. Including such joints in a robot according to the present invention would severely limit the operation of the robot for a number of reasons. The joints suggested by Latzen would have much higher friction and simply physically limit the movement of the ball and socket relative to each other. Additionally, it would not be remotely easy to replace the bearing member of the joint suggested by Latzen as is possible to replace the bearing member according to the present invention.

In view of the above, Clavel concretely defines and illustrates the joints that are utilized in the robot. It is not apparent how such a joint could be replaced with the limited motion joint suggested by Latzen. Nor is it clear how such a combination suggests the present invention as recited in the pending claims.

Matsuoka et al. similarly suggests a socket structure that entirely surrounds the ball.

The arrangement of the present invention minimizes friction and provides the delta robot

with a desired degree of freedom of movement of the delta robot. Additionally, the present invention provides a low weight design that can have a stroke time of about 0.5 sec. The present invention also provides an easily replaceable bearing means that may be exchanged regularly to achieve minimized uneven wear.

The joint socket of the present invention as recited in claims 38 and 39 encloses the joint ball with a space approximately one-half the ball or less. Such a structure permits quick disassembly of the joint and change of the bearing member. Since the socket structure of both Latzen and Matsuoka et al. surround the ball of the ball and socket joint, not only would the structures not provide the degree of movement possible with the structure according to the present invention, but they would also not provide the possibility to easily disassemble the joint and quickly change the bearing member.

By only enclosing approximately one-half of the ball or less the present invention as recited in claims 39 and 39 provides minimal friction in the joint, which helps to provide the robot with a quick stroke time, which may be on the order of about 0.5 seconds. In spite of only covering approximately one-half of the ball or less, the present invention the bearing member is firmly fixed in the socket of the joint, such that the joint can withstand the rotational and directional movements that such joints encounter in use.

In view of the above, the combination of Clavel, Latzen and Matsuoka does not suggest the present invention as recited in claims 38 or 39 or claims 23-28, 30, or 32-37, which depend therefrom.

Therefore, the references relied upon in the office action, whether considered alone or in combination, do not suggest patentable features of the present invention. Therefore, the references relied upon in the office action, whether considered alone or in combination, do not make the present invention obvious. Accordingly, Applicants respectfully request withdrawal of the rejections based upon the cited references.

In conclusion, Applicants respectfully request favorable reconsideration of this case and early issuance of the Notice of Allowance.

If an interview would advance the prosecution of this case, Applicants urge the Examiner to contact the undersigned at the telephone number listed below.

The undersigned authorizes the Commissioner to charge fee insufficiency and credit overpayment associated with this communication to Deposit Account No. 22-0261.

Respectfully submitted,

Date: 1/10/08



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